TOPIC 10 – Pediatric and congenital heart disease

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Transposition of the great arteries is associated with increased ascending aorta stiffness

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Background: Transposition of the great arteries (TGA) is the consequences of abnormal aorticopulmonary septation. Animal embryonic data indicate that septation and elastogenesis are related events. It was showed that carotid artery is markedly and constitutionally stiffer in patients with TGA.

Objective: to assess aortic dimensions and aortic elasticity in patients with TGA using magnetic resonance imaging (MRI).

Methods: MRI was performed in 29 patients with simple TGA operated by an atrial switch procedure (22 male; mean age 29±4 years) and 29 age and gender-matched healthy subjects. RESULTS: TGA patients showed aortic root dilatation (7.7 ± 2.1 vs 6.2 ± 1.2 cm∑, p=0, 0018, in systole, and 6.8 ± 2.1 vs 5.0 ± 1.2 cm∑, p=0.0003, in diastole, at tubular level), reduced aortic root distension (13.5 ± 5.9 vs 24.3 ± 11.7, p<0.0001) and reduced aortic root distensibility (3.5 ± 1.6 vs 5.3 ± 2.4 $mmHg^{-1}.10^{-3}$, p=0.0009). Biomechanical properties of the descending aorta and pulse wave velocity were similar in TGA patients and in healthy subjects. Body mass index, systolic blood pressure, diastolic blood pressure and pulse pressure were similar between patients and healthy subjects, and had no influence on ascending aorta stiffness. No significant correlation was found between index of aortic stiffness and right ventricle (RV) function (end-diastolic and end systolic volumes, RVEF, RV mass, presence or absence of myocardial fibrosis). It did not change after indexation to body surface area of RV function values.

Conclusions: Aortic stiffness in TGA is markedly increased and localized to the ascending aorta. This property could contribute to the dilatation of the ascending aorta part of the new aorta in arterial switch procedure.

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Percutaneous right outflow tract valve implantation: substrate matters.

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Introduction: Percutaneous pulmonary valve insertion has been recently introduced in clinical setting. Patient selection is widely accepted. These candidates are however heterogeneous, in regard of heart defects, and type of surgical right ventricular outflow tract (RVOT) reconstruction. It is presently unclear in the literature if type of surgical reconstruction matters for the success of the pulmonary valve insertion. Our goal was to compare the hemodynamic results of percutaneous pulmonary valve in patients with homografts, prosthetic conduit or RVOT reconstructed with patch.

Patients and methods: We reviewed patients included over the last 6 months in the prospective study (REVALV) for patients undergoing RVOT intervention for severe stenosis and/or insufficiency. Only valved stent group is analyzed here. All patients undergoing valved stent implantation are previously pre-stented with a bare metal stent according to present recommendations. Thirty-seven patients were included, distributed in three groups according to type of RVOT reconstruction (homograft REVALV is a multicentric prospective study for patients undergoing RVOT intervention for severe stenosis and/or insufficiency. Patients are distributed in three groups according to type of RVOT reconstruction (homograft, n=10; prosthetic conduit, n=20; RVOT enlargement by patch, n=7).

Results: Overall, all groups were similar in RV to AP gradient improvement (after pre-stenting mean 30,79 vs 28 p=NS; final result mean 23,71 vs 28,17, p=NS), RV to aorta pressures ratio (after pre-stenting 0,187 vs 0,3117 p=NS; final result man 0,315 vs 0,317, p=NS). If considering non-extensible synthetic tubes we observe that RV-to-AP improvement is significantly worst to the rest of the group (mean 7,07 vs 0,17, p=0,005). When focusing on outflow tract diameter, results did not differ in homograft group and patch group. In contrast, diameter did play a role in those patients having a synthetic tube, with a cut-off at 20 mm diameter. Below 20 mm, relieve of outflow tract gradient was significantly worse than for bigger conduits.

Discussion: Pulmonary valve insertion is efficient in all type of RVOT reconstruction at least in the short term. The diameter of the conduits did not play a role in RVOT obstruction relief as long as surgical substrates are homografts or patch enlargement. In patients with prosthetic conduits, size matters. In non-extensible synthetic tubes results are worst. Reduced distensibility and progressive diameter reduction may lead to not consider these patients as good candidates for this procedure.

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Extension of indications for percutaneous pulmonary valve implantation in native right ventricle outflow tract : should all patients be considered ?

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Introduction: Patient selection for percutaneous pulmonary valve insertion PPVI is widely accepted, being limited to patients having a right ventricle to pulmonary artery conduit. Little data has been reported regarding PPVI on patients having a native RVOT.
We present our data regarding percutaneous PPVI in native RVOT and discuss the specific requirements to make this technique safe and durable.

Patients and methods: We review patients included over the last 12 months in the prospective study (REVALV) for patients undergoing RVOT intervention for severe stenosis and/or insufficiency. Only valved stent on native RVOT group is analyzed here. 10 patients were included. We perform MRI, balloon calibration and angiography of the RVOT to all patients in order to define the RVOT morphology, and to establish a personalized technique for each patient in order to implant a valved stent on the native RVOT. All patients undergoing valved stent implantation are previously pre-stented with a bare metal stent according to present recommendations.

Results: Initial dimensions for these patients were on the upper limit for the established criteria. 2 had a diameter above 24mm. Decision for implanting valved stent was taken based on the fact that pre-stenting reduces RVOT diameter acchieving 22 mm, and giving the native outflow track the stability to prevent valved-stent fractures. For one patient, left pulmonary branch was stented down to the pulmonary trunk in order to have an appropriate diameter for valved-stenting. Pulmonary valve was placed successfully in all cases. All but one had been pre-stented at same procedure than valvulation. Of those, one freshly implanted bare metal stent dislodged to the right pulmonary artery when tenting to place the delivery system for the percutaneous valve. Two extra bare metal stents were implanted in order to cover the branch to the trunk, and finally valved stent was placed with no further problems.

Conclusions: Percutaneous pulmonary valve implantation can be performed on patients having native RVOT with success. Pre-stenting should be performed in a previous intervention in order to ensure stabilization of the bare metal stent and to avoid dislodgements. MRI, angiography and balloon calibration are not discriminating criteria for discarding candidates if personalized techniques are established for each patient. Pulmonary branches can be used as anchors for PPVI.